#### PH 411/511 Electronics

# **RC Oscillator Circuits Full Report**

#### Goals

1. Understand an RC oscillator built with an op-amp. Writing a complete report.

## Background

In the last lab we use an op-amp and an RC circuit to build an oscillator -a circuit that produces an oscillating output from DC input. This circuit uses some positive feedback, so the Golden Rules are not obeyed. But by making some measurements of the voltages we can learn how the circuit works.

# **Experimental Instructions**

### 1. RC oscillator

**a.** Build the oscillator circuit shown below. This circuit has no input! (other than the dc power, and the  $V_{-}$  and  $V_{+}$  positions are swapped vs. lab 5).

When you turn on the dc power, the LED should turn on and off. Afterwards, add an active buzzer to listen to circuit oscillations you created as you vary the 10k potentiometer. Record the period of the LED oscillation by counting the blinking period and compare to the theoretical prediction for an RC circuits ( $\tau = RC$ ).



**b.** *"You've gotta make your owm kind of music!"* Try switching out the 100  $\mu$ F capacitor for a smaller one (recommend 260 nF). Turn the potentiometer to generate your music. Record the time dependence of the both output and probe (TP) voltages on the oscilloscope.

Write a 2-4 paragraphs for your Discussion/Conclusions section that explain what is happening and how the circuit works. For example, predict the oscillation frequency, calculate voltage divider value, how does the op-amp exploit positive/negative feedback (in words).

# **c.** (**optional** CHALLENGE +5 point bonus out of 25) **End of year Bonus oscillator circuit.**

i. Build the below oscillator circuit, take a picture of it in operation, and report the time constant (measured and theoretical). (+2 points)



ii. Adjust the resistance or capacitance of both arms until you can record an output trace on the oscilloscope that matches your predicted period (include in report). (+2 points)

iii. In a paragraph briefly summarize the result. Discuss some advantages and disadvantages of the above oscillator compared to the one in part a. How does is relate to the flip-flop (or SR-Latch) circuit? (+1 point)